

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTONTHE STATUS OF THE SOUTHERN CALIFORNIA TOAD,
BUFO CALIFORNICUS (CAMP).

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In the interest of the Natural History Museum of Stanford University, Mr. Gregory M. Kranzthor and the writer journeyed through the Southwestern States as far as the Davis Mountains in Texas during April and May, 1929. Our objects were chiefly herpetological, though fishes were collected where opportunity offered. Weather conditions were adverse most of the trip but we succeeded in bringing back some rarities, including two *Elaphe bairdi*. Early rains in Texas permitted observations on several amphibians which otherwise would not have been seen until June or July. This, coupled with fortunate circumstances in San Diego County, California, on our trip home, enabled us to make comparisons between the Desert Toad, *Bufo cognatus* Say, and its supposed close relative in Southern California, *B. cognatus californicus* Camp.

Our observations confirm a conclusion reached by the writer long ago, that *californicus* is a distinct species not especially closely related to *cognatus*. The data on which this conclusion is based are as follows:

1. *There is but a single large palmar tubercle present in cognatus, while in californicus, in addition to the large tubercle, a second smaller tubercle is invariably present at the base of the inner finger.*

2. *There is an apparently constant difference in the structure of the outer metatarsal tubercle in the two toads. In cognatus there is a flat tubercle with a free cutting edge. In californicus the tubercle is reduced to a small horny point; no cutting edge is present.*

3. *The under surface of californicus is much less coarsely granulated than that of cognatus. Even young specimens of cognatus show a proportionally coarser areolation than adult californicus.*

4. *The two forms differ in the cranial crests.* The crests of *californicus* are less distinct than those of *cognatus*, and the nasal boss, so conspicuous in the latter, is greatly reduced.

5. *The foot of californicus is comparatively longer than that of cognatus.* The length of the foot, from the inner side of the tibio-tarsal joint to the tip of the longest toe, enters the length from snout tip to vent slightly less than two times in *cognatus* and about one and two-thirds times in *californicus*.

6. *Full grown adults of the two toads differ greatly in size.* *B. cognatus* is constantly a much larger form than *californicus*, which does not equal half the bulk of the larger animal. A female *cognatus* of average size from Pecos, Texas, measures 85 mm. from snout tip to vent, while an exceptionally large female *californicus* from Rincon, San Diego County, reaches but 58 mm.

7. *The two forms are distinctly different in color.* The large light edged green spots of *cognatus* are not present in *californicus*, but instead there are smaller spots distributed irregularly over the back, these being blackish in color. A prominent and very characteristic feature of the coloration of *californicus* is the presence of indefinite but conspicuous whitish areas disposed as follows: A heavy bar across the front of each eyelid meeting at the midline of the head to form an obtuse V, a patch on the front third of each parotoid, a small median spot between the middles of the parotoids, and a pair of elongate spots, diverging posteriorly, on either side of the midline at the middle of the back. The V on the head is seen in *cognatus*, but less whitish in color, and although apparent homologues of some of the other spots may be discerned in this form, these never have the same peculiar indefinite boundaries observed in *californicus*. Further, there is a characteristic mottling of light and dark along the sides which is not seen in *cognatus*. In general appearance it is always possible to distinguish the two toads at a glance, even though occasional specimens of *californicus* have the dorsal dark spots large and arranged much as in *cognatus*.¹

8. *The vocal sacs of the males of the two species differ sharply in form.* The vocal sac of *cognatus* arises from the base of the throat and when inflated is kidney-shaped, extending far forward up in front of the head. (See Dickerson, *Frog Book*, pl. XXXIV, fig. 100.) The vocal sac of *californicus* originates in the normal position and when inflated is of the plain rounded form seen in *B. fowleri*. (Dickerson, *tom. cit.*, pl. XXIX, fig. 83.)

9. *The calls of the two species are vastly different.* The call of *cognatus* is a trilled rattle, with much of the timbre of *Acris* in it. The call of

¹The comparative material of *cognatus* used, although from El Paso County, Texas, appears to agree well with the population of *cognatus* in the Imperial Valley, California. Along the Pecos River in Texas, however, *cognatus* is a very different creature, the large spots breaking up and the crests becoming reduced. More material may show much of taxonomic interest in the *cognatus* population of Texas.

californicus is a sweet trill reminding one of *B. americanus* but somewhat lower and less prolonged.

10. Finally, the habitats of the two forms are trenchantly different, their breeding sites are unlike, and their ranges do not appear to meet. *B. cognatus* is strictly a desert animal throughout its range, living in burrows out in the desert and congregating for breeding at temporary (or in some cases perennial) pools at the advent of the summer rains. It appears to be generally confined to the Lower Sonoran Zone. In San Diego County, at least, *californicus* is met with only in the hills, which are comparatively moist, and most of its range is included in the Upper Sonoran. Here it is confined strictly to the streams in the washes (arroyos) and it is here that it breeds, considerably after the bulk of the winter and spring rains. Temperature appears to be more of a deciding factor than the rains, in this case. In range the two species appear to be separated by a neutral strip of variable width, although when more is known of the western boundary of the range of *cognatus*, this may not be very wide. So far as now known, *cognatus* is limited on the west by the extent of the Salton Sea and its associated waterways, the records being Brawley, Mecca, and Coachella. Our finding of *Bufo woodhousii* at El Centro and at Harper Well within ten miles of the San Diego County line, however, indicates that *cognatus* as well as *woodhousii* may be found at isolated stations right up to the base of the mountains. One has to climb up out of the desert to the comparatively moist heights about Jacumba and Julian (which here reach the Transition Zone) before localities suited to *californicus* are found.

The above points, the most important of which appear to be numbers 1, 2, and 8, show without a shadow of doubt that we are dealing with two forms which can in no way be considered as subspecies. The Southern California Toad must then be known as:

***Bufo californicus* (Camp).**

Bufo cognatus californicus Camp, 1915 (Apr. 2), Univ. California Publ. Zool., XII, No. 12, p. 331 (Orig. description, type locality Santa Paula, 800 ft. alt., Ventura Co., Calif.); Grinnell and Camp, 1917 (July 11), Univ. California Publ. Zool., XVII, No. 10, p. 141, fig. 4 (Range and distrib. map); Stejneger and Barbour, 1917, Check-list North American Amphib. Rept., p. 28 (Range); Hall and Grinnell, 1919 (June 16), Proc. California Acad. Sci., Ser. 4, IX, No. 2, p. 47 (Zonal range); Pratt, 1923, Man. Land Freshw. Vert. Anim. United States, p. 173; Stejneger and Barbour, 1923, Check-list North American Amphib. Rept., p. 25 (Range); Storer, 1925 (June 12), Univ. California Publ. Zool., XXVII, p. 192 (Re-description, history, range, etc.); Klauber, 1928 (July 1), Bull. No. 4, Zool. Soc. San Diego, p. 2 (Range in San Diego Co.); Slevin, 1928 (Sept. 15), Occ. Pap. California Acad. Sci., XVI, p. 107, pl. 16, fig. 2-3 (Description, range, photographs); Klauber, 1929 (Apr. 30), Copeia, No. 170, p. 15 (Range extension).

This distinctive little toad is known from a specimen taken in Tujunga Wash, near Sunland, Los Angeles County, by Dr. Joseph Grinnell, in 1904, another collected by Dr. C. L. Camp on a lawn in Santa Paula, Ventura County, in 1912, and a considerable series obtained in the last few years far to the south, in San Diego County, by Mr. L. M. Klauber and his collectors. The San Diego County records delineate in a general way its distribution in the south and indicate that it may extend some distance further, into Baja California. What its distribution to the north may be still remains almost unknown. There is a gap of ninety miles between the San Diego County records and the Sunland one, and again of forty-five between the latter and Santa Paula. It seems rather strange that other specimens have not come to light to the northward, especially in view of the considerable collecting that has been done about Los Angeles. *Californicus* is a secretive animal, however, and probably never wanders far from the washes in which it lives. Doubtless it occurs somewhat to the north of Santa Paula, following up the stream-beds, and it may reach Santa Barbara. The country between Los Angeles and Monterey is still little known herpetologically.

Bufo californicus does not appear to break its hibernation until about the middle of May. It is in fact rather cold in the mountains of San Diego County until late in spring. We searched unsuccessfully for it in early April and Mr. Klauber tells me that he has not taken it so early in the season. On our return trip, on the night of May 31, 1929, I hunted along the creek near Descanso. It was cold, too cold, I thought, for toads. A number of *Hyla regilla* and a few *H. arenicolor* were calling from various places along the stream. At length a single toad call was heard, a high musical trill, entirely unlike that of *halophilus*. I carefully stalked the animal, but when I approached within what seemed to be twenty-five or thirty feet the call ceased and I was able neither to locate the singer nor induce it to call again. No others were heard and after considerable search we went on.

In San Diego next day we visited Mr. Klauber and he had a number of live adults of *californicus* obtained at Rincon, San Diego County, a few days previously. He says they are easily caught on sandy or gravelly stretches in the bottoms of washes along the streams. If one stands still in the dark in early evening in such localities, particularly in the vicinity of growths of oak, the toads finally begin to move about and can then be found by quick use of the flashlight in the direction of the rustle of the dead leaves.

We are greatly indebted to Mr. Klauber for the gift of six of these fine Rincon specimens. The present paper is based on a study of these individuals, and it was one of them, calling in captivity, that finally enabled me to connect up the call heard at Descanso with this species. The toad called several times in the same clear trill. Mr. Klauber tells me he has often heard these calls in vicinities where *californicus* has been taken but has never been able to refer it definitely to this form.

The "protesting" note of the male *californicus*, given when held without support for its feet, or when walked upon by another toad, is of the same

musical quality as the breeding trill, very different from the coarse note uttered by *cognatus* under the same circumstances.

The end of May and the first part of June appear to be the breeding season of *californicus*. One of the females spawned not long after I had brought it to the University, but the eggs, though fertile, did not complete their development and were lost.

This little toad has a peculiar resemblance to *Scaphiopus couchii*, on account both of size and shape and of the light marks on the back and the mottlings on the sides. It is easily distinguished from half-grown *Bufo canagicus halophilus*, the only other *Bufo* found in its range, by the absence of a conspicuous light median dorsal streak and the presence of cranial crests. Its numerous differences from *cognatus* are sufficiently indicated above. But even though the two species seem to have diverged to a considerable degree, there is abundant evidence that *cognatus* is the closest ally of *californicus*. The cranial crests, nasal boss, short legs, and color pattern all show this relationship. Occasional individuals of *californicus* show traces of the large blotches of *cognatus* and the patterns on the head and back are often very similar. The pattern of *californicus* appears to be derived from one like that of *cognatus* by a breaking up of the large spots and a general obliterating of the sharp borders of the colors in the latter type. The light areas may be partly a new development but the one across the eyelids is seen in the same place but with a definite edging in *cognatus*. Those on the back may be derived from an enlargement of the light edges of the dorsal spots of *cognatus*.

The following life colors were unfortunately taken without Ridgway's Nomenclator in hand. Iris silvery or slightly yellowish gray speckled with black. Upper surfaces various shades of dull brown with a greenish tinge. All warts of back tipped brownish. Blotches black. Hind border of tarsus and rump largely black, the warts whitish. Under surfaces yellowish white, unmarked. Enlarged warts behind angle of mouth largely whitish.

The type and paratype were described by Camp and by Storer as lacking the external metatarsal tubercle. My material possesses this structure, as did Slevin's. Slevin, in his key, has however substituted the inner for the outer tubercle, apparently through a slip. Further, it will be noted that the localities of the type and paratype are placed in the Lower Sonoran, whereas most or all of the San Diego County records are in the Upper Sonoran. It is evident that an amphibian, depending to so great a degree on the presence of water, and in this case restricted to a peculiar habitat, the washes, will not have the same limiting factors in its distribution as one might expect to find in a bird, mammal, or plant. In fact it happens in a large number of cases that attempts to explain amphibian distribution in terms of the ordinarily recognized zonal areas fails in a greater or lesser degree. For even more obvious reasons the fresh-water fishes of, for example, the Western States agree still less well. It is my opinion however that *Bufo californicus*, when more of its distribution is known, will be found to occur largely in the Upper Sonoran.

